Prescribed Fire Design and Implementation

Every prescribed burn must have an accompanying Prescribed Fire Plan (PMS 484-1): a legal document that provides the agency administrator (official that has been delegated or assigned the authority and responsibility for the prescribed fire) the information needed to approve the plan, and the prescribed fire burn boss with the information needed to implement the prescribed fire. A prescribed fire plan must be completed, reviewed, and approved before ignition can begin. The 21 required elements in a fire plan include:

- Complexity analysis: a decision support tool designed to provide insight and improve understanding of the significant risk-related elements of a prescribed fire (such as safety of personnel)
- Description of the prescribed fire area: describes the location, size, topography, vegetation, and fuels within the unit
- Burn objectives: well-defined statements describing how a treatment accomplishes project goals as described through the NEPA process and documented in the decision document. The objectives will determine the ignition patterns and tactics used to implement the burn.
- Prescription parameters: comprised of the measurable criteria during which a prescribed fire may be ignited to meet the burn's objectives. It describes a range of low-to-high limits for the environmental and/or fire behavior parameters required to meet objectives.
- Ignition Plan: describes general ignition operations such as firing methods, devices, techniques, and sequences. During active ignition, actual firing patterns, techniques, sequences, and staffing will be determined and adjusted to meet objectives as dictated by topographic, fuels, and weather factors.
- Smoke management and air quality: describes how the project will comply with local, county, state, tribal, and federal air quality regulations. Identifies any smoke sensitive areas, such as population centers, hospitals, schools, Class I areas, and transportation corridors. May include modeling outputs and mitigation strategies to reduce the impacts of smoke production.

The prescribed fire plan must be written in accordance with the PMS 484, agency policy and direction, and the NEPA decision document. Plans are written in coordination with resource and technical specialists to ensure that the plan meets resource management and operational objectives.

Prescribed burn units are monitored across the George Washington and Jefferson National Forests using several protocols (as resources and funding allow):

- Canopy Gap Analysis (CGA): uses GIS to identify areas of canopy mortality within burn units, up to several years after a burn event. Three categories of forest were delineated, Early-Successional (0-30% canopy cover), Open-Canopied (31-50% canopy cover), and Closed-Canopied (>50% canopy cover).

- Forest Structure and Composition (FSC) Monitoring Protocol: uses field sampling to measure changes in key indicators of ecological condition over time (i.e. overstory, midstory, and understory). The Protocol was first developed in 2009 with the collaboration of The Nature Conservancy. It was specifically designed to determine trends across large landscapes (i.e. multiple burn units), but can also roughly estimate changes within an individual burn unit.

- Photo monitoring: uses permanent points to visually capture vegetative structure and condition over time. Two photos are taken from each plot center, facing North and South. Plots are visited pre-burn, immediately following a burn, one year post-burn, and five years post-burn (if the unit is not burned again before that time).

As of 2015, 78 permanent FSC plots have been established across the South Zone (Clinch Ranger District and Mount Rogers National Recreation Area). The North Fork Pound Unit, first burned in April 2014, has 20 FSC plots that were sampled before and after the treatment. The remaining 58 plots will be sampled as the units they are located in are burned in future years.

Results from the Nork Fork Pound burn unit are summarized below, and can be used to make inferences about fire effects on the surrounding landscape, including the Turkey Cove Project Area.

Initial analysis of a first prescribed burn indicate a reduction in the mid-story that stimulates woody regeneration overall, but seemingly not oak species. These results are compatible with long-term management goals even if all short-term burn plan objectives weren't met after the first entry. This supports the need to establish a *regime* of fire within burn units to fully achieve desired conditions.

On average:

- basal area decreased by 19% (from 79 to 64 ft2/ac)
- canopy cover decreased by 15% (89% to 75%)
- mid-story stem density was reduced by 87% (from 510 to 68 stems/acre)
- density of trees 1 to 4" DBH increased by 256% (653 to 2,321 stems/acre)
    - maple increased by 1,159% (653 to 2,321 stems/acre)
    - oak trended higher from 194 to 236 stems/acre, but results were not statistically significant
- density of small understory stems significantly increased; shrubs by 150% and tree species by 77%
    - oak trended higher from 2.5K to 2.7K stems/acre, but results were not statistically significant
    - maple increased by 366% (from 0.6K to 2.8K stems/acre)
- combined forb, grass, and vine cover increased by 500% (from 1% to 5%)

Figure 1. FSC Plot pre-burn

Figure 2. FSC Plot 2 months after 1st burn

Figure 3. FSC Plot one year post burn

Photos taken at FSC Plot 1-6, South on the North Fork Pound Prescribed Burn Unit. Figure 1 was taken pre-burn, Figure 2 was taken 2 months after the first burn in 2014, and Figure 3 was taken 1 year post-burn. The thick rhododendron and mountain laurel component was significantly reduced following the burn, but began vigorously resprouting soon after. The top-most portion of the leaf litter layer was largely consumed by fire, however the soil layer was not impacted or exposed. Initial analysis of FSC data shows that the prescribed burn objectives were partially met after the first burn, however continued treatments will be necessary to fully meet and maintain desired conditions.